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Filters and Lasers to Bragg About....

Compact Laser Diode Module

Contents

1 Safety Precautions 3
2 Application and Features 4
3 Specifications 4
4 Operating Procedures 7
5 Maintenance 13
6 Service 13

1 Safety Precautions

This instruction manual explains how to use the Compact Laser Diode Module.

Before use, please read this manual thoroughly. After reading, keep it together with the product for reference when necessary. Please retain packaging material in the event the unit is stored or shipped in the future.

1.1 Explanation of Warning Symbols

The meaning of the symbols used in this manual and attached to the product follows.

Warning messages are intended to prevent accidents to operating personnel such as burns and electrical shocks.

Caution messages are intended to prevent damage to the module.

Precaution for handling electrostatic sensitive devices.

Laser emission port, DO NOT STARE INTO BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS.

Warranty void if removed

Warranty void if removed. Do not open the module.

Warning

To prevent permanent damage, observe these precautions:

1. Protect against electrostatic discharge.
2. Avoid external damage to the enclosure.
3. Use supplied power supply or power supply meeting specifications.
4. Do not drop the module or operate it at extreme temperatures or humidity.

2 Application and Features

2.1 Applications

This device is a compact laser diode module with integrated laser diode current driver and temperature control for high precision equipment and instrumentation. It plays a pivotal role in testing or manufacturing, and can be used in various applications such as Flow Cytometry, Confocal Microscopy, Protein Crystallography, DNA Sequencing, Semiconductor Defect Detection, Thin Film Analysis, High Density Data Storage, and Raman Spectroscopy.

2.2 Standard Features

- Plug & Play Operation
- ESD Protection
- Constant Current Driver
- Adjustable Output Power
- Adjustable Temperature Setpoint
- Remote Computer Control Capability
- Built-in User Interface Panel
- Temperature Stabilized
- LCD Display with Buttons for Adjusting Settings
- Compact Size

3 Specifications

OPTICAL	
Power Stability (over 1 hr)	< 1%
Laser Noise (10 to 1Mhz) RMS	< 1%
Laser Class	Class 1, 2, 3a and 3b
Laser Operation	CW
Spatial Mode	TEM_{00}
Beam Divergence (full)	< 1 mrad
Beam Size at Aperture (FWHM)	< 1 mm
Beam Pointing Stability	< ± 10 µrad
Polarization (typical)	> 100:1, vertical or horizontal
Warm-up Time	< 5 min
ELECTRICAL	
Operating Voltage	3.3 V DC
Operating Current	1.5 A max
MECHANICAL	
Laser Dimension	40 mm x 42.5 mm x 100 mm
Weight	< 1 lb
Operating Temperature	+10ºC to +40ºC
Storage Temperature	-40ºC to +80ºC

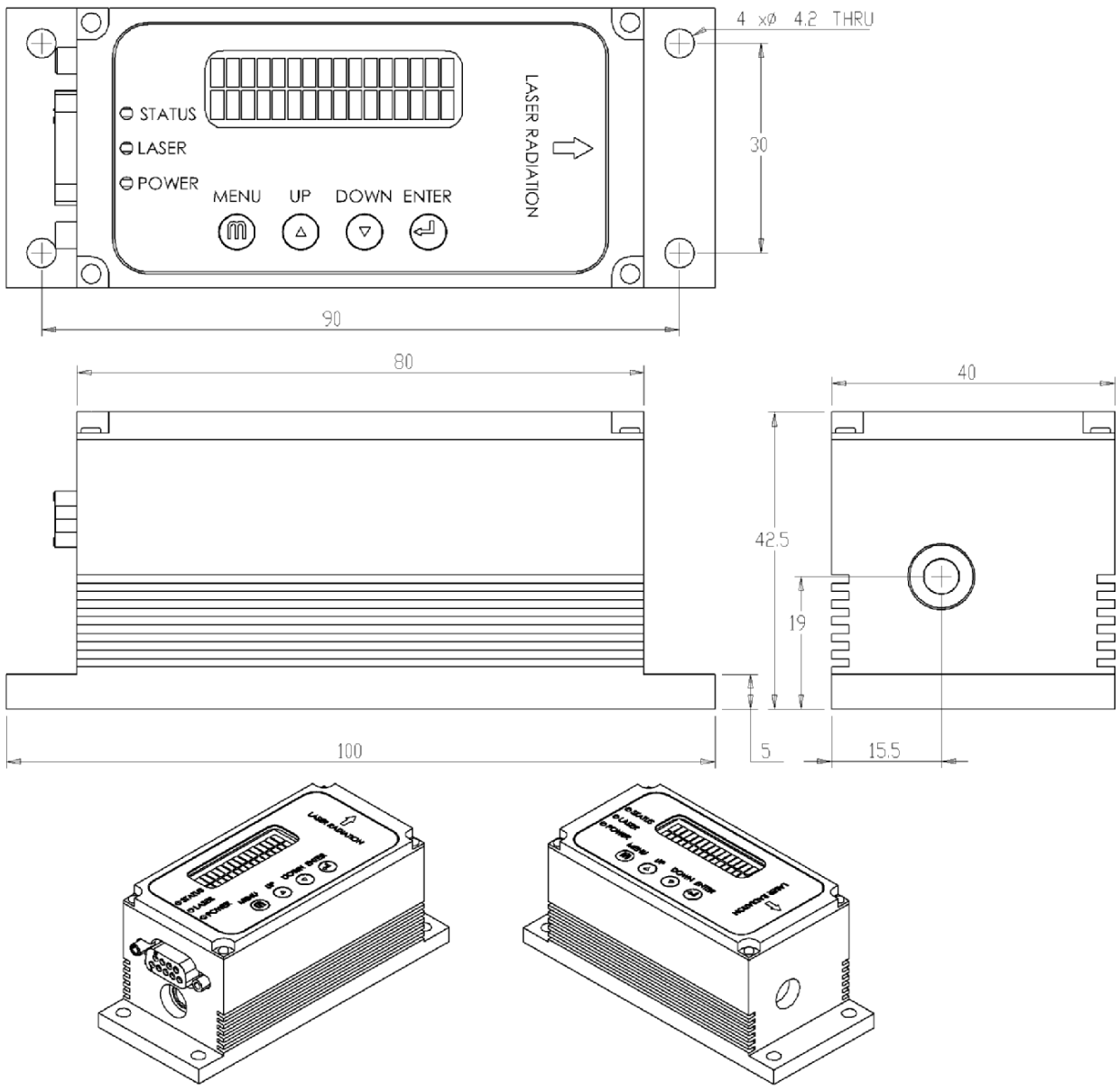
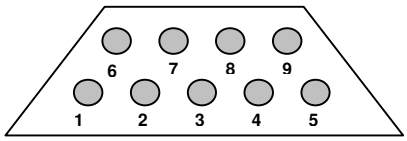


Figure 2: Mechanical Dimensions



Pins	**Definition**	**Description**
1	VCC	Positive Power Pin +3.3V.
2	TXD	Send data to computer (RS232)
3	RXD	Receive data from computer (RS232)
4		Not used
5	GND	GND for power and RS232 communication
6	TTL CON	Outside TTL modulation
7		Not used
8		Not used
9	GND	GND for power and RS232 communication

Note: Pinout is compatible with standard RS232 cable for interfacing with computer port or USB-RS232 adapter. Unit mates with a female DB9 connector.

2.1 x 5.5mm Center Positive Standard Jack for supplying operating voltage and current

GND VCC

Figure 2 – Electrical Connections

Power LED: LED on indicates power on	
Laser LED: LED on indicates laser on	
Status LED:	**Meaning**
Rapid flashing (30 ms on / 30 ms off)	Waiting for temperature to be stable after power on
Fast flashing (100 ms on / 100 ms off)	Waiting for 30 seconds
Flash 1 time (200 ms on / 200 ms off) every 2 s (LED off)	Running normally
Flash 1 time (200 ms off / 200 ms on) every 2 s (LED on)	Over current shut down
Flash 2 times (20 0ms off / 200 ms on) every 2 s (LED on)	Over temperature shut down
Solid	Waiting for settings change using push buttons

4 Operating Procedures

4.1 Standard CW Operation

Laser module can be operated with or without RS232 communication port. Settings can be accessed via push buttons on the laser module as well as RS232 port.

User Startup Procedure:

- Properly mount laser module on a heat sink
- If necessary, connect DB9 interface cable
- Connect power supply

Laser Module Startup Process:

Laser module controller will follow/indicate the following process after power on:

- System will ask to enter password. Default password is 0000.
- The power LED on indicates the controller has received power. Default operating conditions are stored in onboard flash.
- The TEC activates to stabilize temperature to temperature setpoint. Setpoint can be changed via RS232 or push button interface. It will take a few seconds depending on the setting point and environmental conditions. During this period the status LED will flash rapidly.
- Wait 30 seconds before the laser diode emits the power and the status LED will keep flashing fast. Laser controller only operates in constant current mode. Status LED flashes according to table above.

Warning: Laser module will emit light 30 seconds after providing power.

4.3 Push Buttons and LCD Display

The laser controller has 4 push buttons (**"MENU"**, **"UP"**, **"DOWN"**, **"ENTER"**) and a 2x16 LCD alphanumeric information display. . The pushbuttons are used to change various controller settings and laser operation parameters. "MENU" is used to enter or to exit the menu level. "UP" and "DOWN" are used for navigation and change values. "ENTER" chooses menu levels and confirms settings.

- Version display. The LCD shows the software version information for 5 seconds when the unit power is on.

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SN:B099999 V3.27

- Entering password. If password is entered incorrectly for three times, the unit would be locked until power is cycled (unplug and reconnect power cord). Default password is 0000.

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Password: 0000

- Wait for temperature stability after the unit power is on. Temperature setpoint is based on stored setpoint. Display shows actual temperature and TEC current:

Wait TEC Setup
22.00ºC 100.00mA

- Wait 30 seconds for temperature stability. Display shows time countdown:

Wait (sec):30.0
22.00ºC 100.00mA

- Main parameter display during normal operation.

  Display different operating parameter:

  - Normal run mode (constant current).

Laser(I): 100.0mA
22.00ºC 200.0mA

  100.00mA: laser operating current

  22.00ºC: temperature, 200.00mA: TEC current

  - The parameter display can be cycled through the following modes by pressing **"ENTER"**

Temp: 22.00ºC
TEC Cur:200.00mA

.

Current:100.00mA
Temp: 22.00ºC

- Error Messages. Laser will display appropriate message if it reaches conditions that are unsafe.
  - Laser over current. Press **"MENU"**, and then press **"ENTER"** to reset the unit.

Over Current
Shutdown Restart

  - Over temperature shut down. Press **"MENU"**, and then press **"ENTER"** to reset the unit.

Over temperature
Shutdown Restart

- Switching off

- Both the laser and TEC drivers can be switched off by pressing "**DOWN**" while in normal mode.

TEC,LD Operation
Enter OFF_

After confirmation, the controller stops both drivers and it changes the screen to the following one.

TEC & Laser OFF
Any key restart

The system will restart by pressing any pushbutton.

- Settings Display

The setting menu block is selected by pressing **"MENU"** in a normal running mode. Within the menu block, pressing **"UP"** or **"DOWN"** navigates between menu items. Press **"ENTER"** to select the item. Pressing **"MENU"** will exit the setting menu without saving the changes to flash. All the settings will go back to the previous setting after the unit is reset or re-powered.

- Set TEC temperature

Set TEC Temp
10-50ºC: 22.00

22.00: The previous set point

Press **"ENTER"** to change the temperature set point. Otherwise press **"UP"** or **"DOWN"** to change the setting menu

After pressing **"ENTER"** the unit will enter the parameter setting mode and the cursor will change from "S" to "2" which is the first digit of the parameter. Then press **"UP"** or **"DOWN"** to change the digit from "0" to "9" or ".". After finished setting this digit, press **"ENTER"** to move to next digit. When you finish setting the last digit and press **"ENTER"** the parameter will affect right away then the cursor will revert to "S" at the same time. All the following parameter settings are the same.

Set TEC Temp
10-50ºC: 22.00

- TEC Operation

TEC Operation
State: ON

TEC Operation
State: OFF

Press **"ENTER"** to select TEC operation and the cursor will go down to the "O". Then pressing the **"UP"** or **"DOWN"** will set TEC on or off. The TEC will not turn on or off until pressing **"ENTER"** to confirm the operation. Pressing **"MENU"** will cancel the change. All the following setups for selecting ON/OFF or Disable/Enable are the same as the TEC operation.

- Set ACC Current

Set ACC Current
<=100.0mA:100.00

The maximum ACC current is the ACC full current.

- Disable/Enable Laser ACC Driver

ACC Operation
State: Disable

ACC Operation
State: Enable

- On/Off Laser ACC Driver

ACC Operation
State: ON

ACC Operation
State: OFF

- Set Laser Current Limit

Max Current Limit
(mA): 400.00

If the laser current is over this value the laser will be shut down.

- Change Laser Run Mode

Change Run Mode
Run Default Mode

Press **"ENTER"**, and then press **"UP"** or **"DOWN"** to change the run mode to "Internal Modulation" or "Default". Settings change only takes effect when exiting the setting menu. "Internal Modulation" is unsupported and should not be used.

- Save to flash and exit the setting menu

Save to Flash
and Exit

All the setting parameters will be saved to flash memory. So the laser will keep this setting even when the unit is reset or repowered.

4.4 Operation via Communications Port

The laser system includes complete remote control capability through RS232. All RS232 commands are available after laser system auto start.

4.4.1 Baud rates and serial port settings

Each controller is shipped from the factory with a fixed 9600 baud, which cannot be changed.

The other serial port parameters are: 8 data bits, 1 stop bit and no parity. A hardware flow control is not supported.

4.4.2 Command formatting and termination characters

Each command to the controller must be terminated by a carriage return/line feed pair (ASCII 13 followed by ASCII 10).

All commands are case-sensitive.

Command arguments must be delimited by a single colon ':' character (ASCII 58).

4.4.3 Handshaking

Under no circumstances will the controller initiate communication. It only transmits characters in response to a message. Every message to the controller generates a response, either a numerical value or the acknowledgment string "OK". In the event that the controller receives a message that it cannot interpret, it responds: "ERROR". Every controller response is terminated by a carriage return/line feed pair (ASCII 13 followed by ASCII 10).

4.4.4 RS-232 Commands

Commands	Argument	Response	Function
rlp?	No	**.**	Return the laser output power in mW
rli?	No	**.**	Return the present operating current of the laser diode in mA
rtt?	No	**.**	Return the TEC present measured temperature of laser diode in degrees Celsius
rti?	No	**.**	Return the TEC present operating current in mA
len	No	OK	Enable laser APC driver
ldis	No	OK	Disable laser APC driver
lon	No	OK	Turn on the laser emission output power
loff	No	OK	Turn off the laser emission output power
stt:	**.**	OK	Set the TEC temperature in degrees Celsius(Default:22 Degree)
slc:	**.**	OK	Set ACC driver current in mA
clfp:	**.**	OK	Calibrate the laser power/Set the laser full power value in mW
stm	No	OK	Start inner TTL modulation
ctm	No	OK	Stop inner TTL modulation
tecon	No	OK	Enable TEC control

tecoff	No	OK	Shut down TEC control
sps	No	OK	Start APC power scan
cps	No	OK	Stop APC power scan
slp:	**.**	OK	Set the laser output power from 0.0 to full power(Default: Full power)
rsv?	No	******	Return the laser system firmware version
stont:	**.**	OK	Set inner TTL modulation on time, no less than 0.01ms
stofft:	**.**	OK	Set inner TTL modulation off time, no less than 0.01ms
stsont:	**.**	OK	Set power scan on time in ms, no less than 0.01
stsofft:	**.**	OK	Set power scan off time in ms, no less than 0.01
ssps:	***	OK	Set APC power scan step
rslp?	No	**.**	Return the present laser setting power in mW
rclp?	No	**.**	Return the present laser full power
rstt?	No	**.**	Return the TEC set up temperature
rstli?	No	**.**	Return the ACC set up current in mA
ssc	No	OK	Save the setting to the flash memory so the laser system can operate in the same setting after repower it
rlrs?	No	*	Read laser controller run status 1, Laser controller runs normally 2, Inner TTL modulation 3, Laser power scan 4, Waiting for calibrate laser power 5, Over laser current shutdown 6, TEC over temperature shutdown 7, Waiting temperature stable 8, Waiting 30 seconds
smlc:	**.**	OK	Set the maximum laser diode current in mA, if the current is over the limit the laser will shut down.
rlcm?	No	**.**	Read the maximum laser current in mA
reset	No	OK	Reset the laser controller
rsn?	No	*******	Return the laser controller serial number
lcen	No	OK	Enable ACC laser driver
lcdis	No	OK	Disable ACC laser driver
lcon	No	OK	Turn on ACC laser driver
lcoff	No	OK	Turn off ACC laser driver

5 Maintenance

5.1 Maintenance and Inspection

Routine maintenance is not required. If the unit appears to be operating incorrectly or with low output power, check the following:

- Inspect the enclosure for scratches, dings, dents, or other signs of damage due to handling.
- Verify that the module enclosure has not been opened and the factory seal is intact.
- Verify power source connections to the laser module.
- Ensure that the operating environment is within specifications.

6 Service

6.1 Repair

If the module fails during use, check the items in section 5.1 before requesting an RMA.

Defective modules that are beyond the warranty period will be repaired at cost, if possible. An RMA must be requested before sending it to Ondax. When shipping, please use a box at least five times as large as the module with enough packaging material to prevent any movement of the module within the box.

6.2 For Information or Enquiries

If you need information regarding purchase or repair, or for any other Sales related questions, please contact the distributor or selling agent from whom the module was purchased.

6.3 Ondax Limited Warranty

Ondax warrants that all **SureLock™** integrated laser modules (RO, FCLM, LM) will be free from defects in material and workmanship for 12 months from the date of shipment. This limited warranty covers only those defects that arise as a result of normal use of the product, and does not cover any other problems, including those that arise as a result of: (i) improper handling, maintenance or modification, (ii) operation outside the product's specifications; or (iii) unauthorized modification or misuse.

If Ondax receives, during the applicable warranty period, notice of a defect in any product which is covered by this warranty, Ondax shall either repair or replace the product, at Ondax's option. Ondax shall have no obligation to repair, replace or refund until the customer returns the defective product to Ondax. Any replacement product may be either new or like-new, provided that it has functionality at least equal to that of the product being replaced. Ondax products may contain remanufactured parts, components, or materials equivalent to new in performance.

Limitations of Liability

1. TO THE EXTENT ALLOWED BY LOCAL LAW, NEITHER ONDAX NOR ITS THIRD PARTY SUPPLIERS MAKES ANY OTHER WARRANTY OR CONDITION OF ANY KIND, WHETHER EXPRESS OR IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, AND FITNESS FOR A PARTICULAR PURPOSE.
2. TO THE EXTENT ALLOWED BY LOCAL LAW, EXCEPT FOR THE OBLIGATIONS SPECIFICALLY SET FORTH IN THIS WARRANTY STATEMENT, IN NO EVENT SHALL ONDAX OR ITS THIRD PARTY SUPPLIERS BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY AND WHETHER ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.
3. To the extent allowed by local law, the remedies provided in this Limited Warranty Statement are the customer's sole and exclusive remedies.

6.4 Contacting Ondax

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